# THE EFFECTS OF PEER-INTERACTION STYLES IN TEAM BLOGS ON STUDENTS' COGNITIVE THINKING AND BLOG PARTICIPATION

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### ABSTRACT

Deep cognitive thinking refers to a learner's purposeful and conscious manipulation of ideas toward meaningful learning. Strategies such as journaling/blogging and peer feedback have been found to promote deep thinking. This article reports a research study about the effects of two different blog leader styles on students' deep thinking as exhibited on blogs. Thirty-four students in two sections of a class were assigned in three to five member groups and blogged for 10 weeks. In the first section, the "starters" of each week's blog introduced articles with two alternative views about a current topic, posted a few questions, and the rest of the group responded to the questions. In contrast, the "starters" in the second section wrote a post and the rest of the team commented on the post. Data analyses revealed that different starter styles influenced both the quantity and quality of starters' posts as well as peer feedback.

## INTRODUCTION

Deep cognitive thinking refers to a learner's purposeful and conscious activity of manipulating ideas toward meaningful and integrated learning (Novak, 1998). Doubtful situations trigger reflection (Dewey, 1933), which in turn serves to

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accommodate new information and minimize the "disequilibrium" in learners. Deep cognitive thinking can be further elevated when the learner begins to contextualize thinking to find the cause and effect of the situation. In order to illustrate the process of deep cognitive learning, Moon (1999) proposed a model, namely "a map of learning," synthesizing the theories of cognitive structure, Piaget's (1970) theory of assimilation and accommodation, and information processing theory etc. In her model, Moon identifies learning as a continuum ranging from the stage of "noticing," "making sense," "making meaning," "working-with-meaning," to "transformative learning" (1999, p. 139). The first two stages are surface learning where the learner simply memorizes new ideas; while beginning at the third stage the learner engages in deep, or higher-level cognitive thinking, learning by actively integrating new ideas into the existing cognitive structure.

Moon attempts to explain cognitive learning from an individualistic information processing perspective. In contrast, social constructivism emphasizes the role of social discourse and interaction, with the community and culture serving as an agent in students' meaning making and deep cognitive thinking (Vygotsky, 1978). Schellens and Valcke (2005) synthesized a model of cognitive processing in a collaborative learning environment. In this model, cognitive thinking occurs at both the individual and social level in five phases:

1. sharing/comparing;
2. dissonance/inconsistency;
3. negotiating and co-construction;
4. testing tentative constructions;
5. statement/application of newly constructed knowledge (Schellens & Valcke 2005, p. 960).

A combination of perspectives from Moon's model and social constructivism will be used to frame this study. In general, deep cognitive thinking refers to a learner's conscious activity of making sense and meaning of new information, and purposefully developing a tolerance to alternative viewpoints, and eventually resolving dissonances with peers or across contexts.

The complex nature of deep cognitive thinking has resulted in difficulties for practitioners and researchers to inculcate deep thinking in students. Current Web 2.0 technologies, which represent a trend in social networking technologies that encourage creative information sharing and constructive knowledge building, have been used in education to foster constructivist learning environments (Boulos, Maramba, & Wheeler, 2006). Such technologies include Weblogs (online journal systems; e.g., blogger.com), Wikis (collaborative websites editable by a community of users; e.g., Wikipedia.com), online discussion boards, video-sharing sites (e.g., youtube.com), and social-networking sites (e.g., facebook.com).

The constructive and shared nature of these Web 2.0 technologies can provide a number of educational affordances and pedagogical benefits. For example, as a popular web-publishing and online journaling tool, blogs can facilitate reflective and higher order thinking because bloggers and readers can easily access different points of views. As Sharma and Xie (2008) reported, student bloggers described that their classmates' blogs or comments provided diverse perspectives and information so that they could gain a holistic, in-depth view of the content. Journaling, the main learning activity in blogging, has been found to be a means by which students can externalize their reasoning and reflections on experiences (Fiedler, Reiman, Mittendorfer, Sharma, Paquet, Efimova et al., 2004; Stickel & Trimmer, 1994) and then reframe experiences within the learning context (Andrusyszyn & Davie, 1997). Moreover, blogs, like e-portfolios, allow students to see the progress of their thoughts over time (Ellison &Wu, 2008). Baggetun and Wasson (2006) also suggested that weblogs could represent an individual's growing knowledge base. However, previous research has also indicated that higher order thinking is an effortful action and it is generally difficult to engage students in such activities over an extended period of time without external support (Harri-Augstein & Thomas, 1991). Additionally there is evidence that most college students usually stop at the lower level of reflective activities (Bradley, Thom, Hayes, & Hay, 2008; King & Kitchener, 1994).

Various strategies have been recommended for encouraging higher order thinking during blogging. Among them, peer feedback integrated into a blogging activity has been identified as one possible effective method of promoting students' thinking. Boud (1999) suggested that working with peers rather than someone who was presumably "superior," such as a mentor or teacher, can help higher order thinking. Rourke and Anderson (2002) confirmed that peer-led discussions were useful in achieving higher-order, but not lower-order learning objectives because the controversial perspectives offered by other peers disturbed students' initial understanding of the content and therefore prompted them to process it thoroughly. Moon (1999) has also suggested that working with "critical friends" can facilitate reflection. Based on Moon's suggestion, one could propose that if critical friends provide constructive feedback to their peers' individual journaling process, all parties could possibly see different perspectives, which may influence or even fundamentally change the way students assimilate and accommodate information.

Xie, Ke, and Sharma (2008) conducted an empirical examination on the inter-action effects of paired peer feedback and blogging on college students' reflective thinking skills and their learning approaches. The control group blogged for one semester without peer or instructor input. For the treatment group, students kept blogs and responded to their paired peer's blogs. The findings suggested that students' reflective thinking level increased significantly over time as exhibited in their blog posts; however, peer feedback was found to inversely

affect students' reflective thinking skills. In this study, the students in the treatment group were paired. There seemed to be a reciprocal adverse effect on their attitude toward reflection from peers. It was found that if one of the pair didn't demonstrate higher level of reflective thinking in their blogs, it was very likely that the other would not engage in higher level of reflective thinking either. Additionally, a closer look at the peer feedback in this study revealed that students did not engage in meaningful or constructive feedback activity, possibly due to the lack of instructor moderation. As previous researchers (e.g., Slavin, 1995) pointed out, peer feedback should be constantly moderated to reduce off-track and passive behaviors in interactive discourse.

To minimize the reciprocal adverse effect, the study reported in this article was designed to accommodate students into 4-5 member groups in their blogging exercises. Paired peer feedback on blogs is a task demanding member interdependence on each other. According to Wagner and Gooding (1987), task interdependence (vs. task independence) refers to the extent to which the outcome efficacy of participatory processes necessitates sequential or reciprocal interdependence among members of a group. Paired peer feedback demands constant exchanges of information such as comments and critics between the peers to be effective. Thus, non-participation from one peer could render the process useless because the other peer could completely lose the motivation of writing blogs or commenting on the peer's blogs. While searching for the optimal group size for such a member-interdependent task, Kameda, Stasson, Davis, Parks, and Zimmerman (1992) found that college students' motivation pattern took an inverted U-shape, "peaking when the entire group was divided into moderate-sized (four-person) subgroups and declining for the smaller and larger subgroups" (p. 54). Comparing to a paired peer group, a moderate group size may curb possible losses of motivation because exchanges of information are more likely to occur with more people in the group.

Team blogs, similar to other online forums, can enhance student engagement, collaborative thinking, critical analysis, and social construction of knowledge in the discussion (Garrison, Anderson, & Archer, 2000; Ruberg, Moore, & Taylor, 1996). The efficacy of such online forums largely depends on the effectiveness of peer interactions. To encourage peer participation in online knowledge-sharing and -building environments, in an effort to promote students' higher order thinking, previous studies examined a variety of variables of online discussion, such as choice of topics (e.g., Bradley et al., 2008; Chen & Chiu, 2008), peer-interaction styles including facilitator techniques (e.g., Han & Park, 2008; Hew & Cheung, 2008) and role assignments (e.g., Hara, Bonk, & Angeli, 2000). Chen and Chiu (2008) found that topics involving disagreements were likely to engage participants and provoke critical remarks in their online discussions. Further, while examining the facilitation techniques employed by student facilitators, Hew and Cheung (2008) found that two techniques were most effective to attract group members to participate in online discussion:

questioning and sharing personal opinions or experiences. Hara, Bonk, and Angeli (2000) suggested that assigning a specific role to each participant—starter (the participant who initiates a post to start an online discussion) or wrapper (the team member who synthesizes all posts in a thread to wrap up the discussion)—could increase the coherence of online discussion. However, few studies have investigated how different styles of discussion leaders influence their peer interaction patterns and hence affect their discussion behaviors. For example, Wu and Hiltz (2004) called for further explorations into "different dimensions of the discussion leader role" and the effect of such roles on students' online discussion and learning (p. 148).

To expand these research findings, this study used a quasi-experimental design to examine the effect of peer-interaction styles, specifically different starter styles (questioning versus monologuing), on students' online blog participation and thinking exhibited on their blog posts. The questioning starters were instructed to present articles with two alternative views about a current topic, and then initiate the team blog conversation with a few questions about the chosen topic, whereas the monologuing starter wrote a self-sufficient blog post of a topic based on his or her interest. Thirty-four students in two sections of the same class taught by the same instructor were engaged in team blogs for 10 weeks. Both sections had an equal number of students (i.e., 17 each). This article details the research effort of utilizing team blogs in an undergraduate class and assesses the effects of the peer-interaction strategies on students' deep cognitive thinking as exhibited in their blog posts and blog participation.

## Research Questions

This study aimed to investigate the effect of different peer interaction styles for blogging on undergraduate students' cognitive thinking as demonstrated by blog posts and comments. The research questions were:

- Will the different starter styles (questioning vs. monologuing) affect the quality of student starter posts in terms of deep cognitive thinking, as exhibited by these posts and the length of the starter posts (measured by the number of meaningful units contained in the posts)?
- Will the different starter styles (questioning vs. monologuing) affect the quality of their group members' (commenters') replies in terms of their deep cognitive thinking, as exhibited by these replies and the length of the commenting posts (measured by the number of meaningful units contained in these posts)?
- Will being a starter versus being a commenter influence the number and the nature of meaningful units in their online blogging posts?
- Will participants' thinking level demonstrated in their blog posts as starters predict their thinking level as commenters?

## METHOD

The research involved an empirical study that examined students' usage of a weblog over a regular university semester lasting 15 weeks. Data were collected from a content analysis with weekly blogs and comments on the blogs.

### Participants

Thirty-four undergraduate students enrolled in two sections of an introductory English course at a Northeastern land-grant university participated in the study. The class met 3 hours a week, supplemented by the weekly blogging assignments. All students indicated that they were first year students, ranging in ages from 18 to 30, and 13 were female. Failure to complete weekly weblog journals led to some subject attrition (4 out of 34). Each section has an equal number of students being excluded from the study and none of the four students belonged to the same group. Data from 30 students were used for analysis.

### Instruments

In order to evaluate the objective evidence for students' cognitive engagement in their blogging, the authors of this study conducted content analysis with archived online blogging transcripts. Like Beers, Boshuizen, Kirschner, and Gijselaers (2007), the authors of this study perceived that a new online learning research project, when focusing on a different theoretical framework or a different research purpose, will generally require new coding themes for analysis. Moreover, further analysis showed existing coding schemes did not seem applicable to our study. For example, Henri's work (1992) examined the quality of online postings only based on cognitive information processing model. Another popular model, the framework of Gunawardena, Lowe, and Anderson (1997), focused on evidence of knowledge building in online forums from a social constructivism paradigm. However, we hold the belief that cognitive thinking involved in team blogging activities should not only include the social constructivist view of learning but also keep students' individual cognition in consideration. Therefore, rather than using an existing content coding scheme, the online interaction transcripts were analyzed using a new analysis scheme based on the Online Learning Interaction Model (Ke & Xie, 2009). This model was developed based on the theoretical framework of deep cognitive thinking (Moon, 1999; Schellens & Valcke, 2005) and a synthesis of these two representative content analysis schemes in the distance education literature as mentioned above.

In this model, the unit of analysis was the "thematic unit" (Henri, 1992). Each unit was classified into one of the five analytic categories, as outlined in Figure 1. This coding framework highlights a knowledge construction process that ranges from the stage of surface, individualistic learning (K1) gradually (K2 as transition)

| K1 | Knowledge Construction | Sharing information | Simply adding facts, opinions, or questions without elaboration |
|---|---|---|---|
| K2 | | Egocentric clarification | Elaborating one's own arguments/concepts/ problem solutions citing one's own experience/observation (e.g., "From my experiences . . ."; "I remember when I was in physics . . .") or citing books, reading materials, and knowledge learned before (e.g., "As the book says . . .); "According to X theory . . ."). |
| K3 | | Allocentric elaboration | Comparing and synthesizing peers' multiple perspectives<br>• Summarization: "I liked all of your posts, but I believe that . . ."<br>• Extended Understanding: "Let me take this a step further"; "Most of you have only discussed positive aspects, I want to know if you have had negative experiences" |
| K4 | | Judgment | Making value judgments and drawing conclusions |
| K5 | | Application | Planning future application of new knowledge or proposing in-field application strategies |

Figure 1.  Refined model of Knowledge Construction based on
Henri's (1992) content analysis model and the
*Online Learning Interaction Model* (Ke & Xie, 2009).

to deep, collaborative learning (K3 and K5) where the learner actively synthesizes and integrates new ideas and then turns new knowledge into application.

## Procedure

The course had two sections taught by the same instructor, each with 17 students. The instructor of the course, with the help of the researchers, incorporated a blogging assignment into the course syllabus. Blogger (http://www. blogger.com), one of the most widely used blog services, was used in this study. To avoid the possible "reciprocal adverse effect" observed in a previous study that employed paired peer feedback (Xie et al., 2008), in this study researchers and the instructor randomly assigned students into four groups in each section of

the course. Each group had four to five group members. Each blog group had leaders or starters who were responsible for initiating weekly blog posts at the beginning of the week and the rest of the group members were required to provide feedback to this blog post. In all eight groups, students rotated leadership every week so that each student served as starters at least twice and in some cases three times, depending on the group size.

Blog leaders or starters in different sections were required to take different starter styles—questioning or monologuing. For the first four groups in section one, the "leader" (Hara et al., 2000) of each week's blog introduced two alternative views with articles about a current topic, such as the opposing points of view from presidential candidates about one issue, shared his/her own thoughts about the topic, and posted a few questions. The rest of the group responded to the questions or provided feedback to the starter's thoughts. These groups are referred as "questioning starter" hereafter in this article. In contrast, the "leader" in the second section (including another four groups) found a topic based on his or her interest, wrote a self-sufficient blog post, stating his/her own point of view about the topic in the form of a monologue. The rest of the team commented on the post. Hereafter, these four groups in the second section are called "monologuing starter" group.

Participants were told that the course requirements included the completion of the blogs using Blogger.com and that they must write at least one post or comment every week. In order to motivate students, this assignment was worth 10% of their total grades. The instructor dedicated one class session as an orientation for students to learn how to use Blogger.com and write blogs and comments. The instructor also blogged in order to model the activity.

Researchers suggest that encouragement or moderation from an instructor facilitator should be employed in online discussion to increase participation (Tagg & Dickinson, 1995) Therefore, in this study students' blogs and peer feedbacks received constant moderation from the instructor throughout the semester. Most of the moderations, according to the instructor, informed students of appropriate procedures or evaluated participants' online posts.

To ensure that participants were equivalent in terms of their content knowledge as demonstrated in writing assignments, an essay pretest was given in the first week of the course. The instructor graded the essays and assigned a grade representing both the writing quality and his own interpretation of the cognitive level of their writing. Later, the researchers also coded the essays with the *Online Learning Interaction Model* (Ke & Xie, 2009). Table 1 shows that there was no significant difference between these two sections of participants.

At the end of the semester, all blog posts were gathered and coded.

Table 1.  Cognitive Thinking Equivalency of Two Sections of
Participants as Exhibited in Pre-Test Essays

|  | N | Instructor's score (top possible = 100) | Researchers' score (top possible = 5) |
|---|---|---|---|
| Section One | 17 | 79.47 (7.10) | 1.25 (.46) |
| Section Two | 17 | 81.60 (6.25) | 1.37 (.51) |
| p-Value |  | .39 | .43 |

**Note**:  Standard deviations in parentheses.

## Data Analysis

The researchers employed Ke and Xie's (2009) *Online Learning Interaction Model* to code blog posts and comments in an effort to determine the participants' thinking levels. The unit of analysis was one paragraph, which was referred to as a "meaningful unit" because it reflects the participants' "single idea unit" (Henri, 1992). Each meaningful unit was assigned a code from this coding scheme. Two raters coded the posts. After reaching 100% agreement on scoring of the first group's blog and comments, both raters scored the remaining posts. The calculated inter-rater reliability (Cohen's Kappa) was .94 for the coding of the blogs and group members' comments. To measure the length of each post, the number of meaningful units contained in each post was also noted. Since each participant served as both starter and commenter at different weeks and for multiple times during the semester, we captured the following measures for later comparisons:

- For starters of the blog posts in both sections:
  1. Average number of meaningful units in the starter posts: generated by dividing the total number of meaningful units in all starter posts by the number of times each participant served as the starter. This serves as an indicator for the average length of each participant's starter posts.
  2. Highest single cognitive score across all meaningful units in the starter post. This measure indicated the highest level of each participant's critical thinking exhibited in his or her starter blog posts. In other words, it showed the most advanced level of critical thinking as exhibited by each participant when he or she served as the starter.
  3. Average cognitive score of all meaningful units in the starter posts. Cognitive score is calculated by converting categories of analytical categories of meaningful units into numerical values—K1 counted as 1 and K5 counted as 5.

4. For each of the starter posts, the number of meaningful units under each analytical category, namely k1, k2, k3, k4, and k5.

- For commenters of the blog posts:
  1. Average number of meaningful units per commenter post: generated by dividing the total number of meaningful units in all reply posts by the number of times each participant served as the commenter. This is used as a measure for the average length of each participant's reply posts.
  2. Highest single cognitive score across all meaningful units in the commenter post. This measure indicated the highest level of each participant's critical thinking exhibited in his or her feedback to blog posts. In other words, it showed how critical each participant could have been when he or she served as the commenter.
  3. Average cognitive score of all meaningful units in the commenter posts across the entire 9 weeks of discussion.
  4. For each of the comment posts, the number of meaningful units under each analytical category, namely k1, k2, k3, k4, and k5.

- A number of *t* tests were conducted to examine:
  1. the cognitive scores and number of meaningful units of starters' blogs in different sections of the course;
  2. the cognitive scores and number of meaningful units of commenters' replies in both sections; and
  3. the number and nature of meaningful units in each cognitive analytical category (k1-k5) between starters' posts and commenters' posts.

Then three correlation analyses were conducted to examine whether participants' cognitive thinking level as starters would correlate with their cognitive thinking level as commenters.

## RESULTS

### Students' Blog Activity

In order to give the readers of this article a general idea of students' blog activities, Table 2 shows a summary of student groups' blog activities by class section.

### Research Question 1: Starters' Posts

Table 3 shows the starters' average and highest cognitive scores for both groups in all samplings and the average number of meaningful units contained in the starters' posts.

The *t* test of starters' post lengths (average meaningful units per starter post) showed that in general the questioning group starters wrote fewer meaningful

Table 2. Summary of Student Groups' Blog Participation by Section

| Section | Total words per group | Average number of weekly blogs | Average words per starter post | Total words of starter posts per group | Average number of comments | Average words per comment | Total words of comments per group |
|---|---|---|---|---|---|---|---|
| One | 4106 | 7.50 | 249.25 | 1876.75 | 17.5 | 126.50 | 2229.50 |
| Two | 4570 | 8.25 | 330.50 | 2717.25 | 15 | 130.35 | 1853.00 |
| Grand average | 4338.25 | 7.88 | 289.72 | 2297.00 | 16.25 | 128.39 | 2041.25 |

Table 3. Blog Posts' Length and Cognitive Learning Scores of Blog Starters with Different Starter Styles

| Group | N | Average number of units per post | Highest cognitive score | Average cognitive score |
|---|---|---|---|---|
| Questioning starters (Section One) | 15 | 1.67 (1.01) | 2.23 (1.23) | 1.57 (.53) |
| Monologuing starters (Section Two) | 15 | 2.87 (1.05) | 2.93 (1.33) | 1.84 (.72) |
| p-Value | | $p = .003$** | $p = .07$ | $p = .12$ |

**Note**: Standard deviations in parentheses.
**$p < .01$.

units than those students in the monologuing group (1.67 vs. 2.87), and the difference was 1.2. The questioning group wrote 1-2 paragraphs, whereas the monologuing group wrote 2-3 paragraphs in their starter posts. This result showed that the monologuing starters usually wrote one paragraph more than the questioning starters. This difference was statistically significant at the .01 level ($p = .003$). In the population, when engaged in monologuing-type of blogging, students' posts tend to be longer than when engaged in mainly posing questions.

Two $t$ tests of starters' cognitive scores indicated that the monologuing group starters had larger average cognitive scores (1.84 vs. 1.57) than the questioning group starters. Similarly, the monologuing starters had larger "highest cognitive scores" (2.93 vs. 2.23) when compared to the questioning group starters, as exhibited in their blog posts. The differences were .47 and .70 respectively, however, neither of these differences were statistically significant ($p = .12$ and $p = .07$).

For the first research question, it was found that the monologuing style encouraged blog starters to write in longer lengths and engage in deeper level of thinking than the questioning style of the blog starters.

## Research Question 2:  Commenters' Posts

Table 4 shows the commenters' average and highest cognitive scores in both groups in all samplings and the average number of meaningful units contained in the commenters' replies.

The $t$ test of commenters' average meaningful units per reply post showed no difference in the length of comments between the questioning group and the monologuing group (1.15 vs. 1.08). This result indicates that in both groups, commenters usually wrote one to two paragraphs in their comments, and the lengths of their comments were not affected by the different starter styles (questioning vs. monologuing).

The two $t$ tests of starters' cognitive scores indicated that the questioning group commenters had larger average scores (3.30 vs. 2.67) and the highest scores (3.38 vs. 2.71) when compared to the monologuing group commenters. The differences were .63 and .67. Moreover, one of these differences (the highest cognitive score) was statistically significant at the .05 level ($p = .09$ and $p = .04$ respectively). In general, student commenters in the first section (with questioning starters) wrote relatively more critical comments than those in the second section (with monologuing starters). In the population, when prompted with controversial questions, students tend to respond more critically in their replies than when presented with self-sufficient passages of information.

For the second research question, the results showed that although the lengths of their comments in both groups did not differ, the questioning style starters encouraged their group members to comment at a higher cognitive level than the monologuing style starters did.

Table 4. Reply Posts' Lengths and Cognitive Learning Scores of Commenters with Different Styles of Starters

| Group | N | Average number of units per post | Highest cognitive score | Average cognitive score |
|---|---|---|---|---|
| Commenters in Questioning starters' groups (Section One) | 15 | 1.15 (.31) | 3.38 (1.21) | 3.30 (.97) |
| Commenters in Monologuing starters' groups (Section Two) | 15 | 1.08 (.26) | 2.71 (.96) | 2.67 (.90) |
| p-Value | | p = .52 | p = .04* | p = .09 |

Note: Standard deviations in parentheses.
*p < .05.

### Research Question 3:  Comparison of Starters' and Commenters' Posts

A *t*-test was conducted to examine whether there was a significant difference between starters' posts ($n = 63$) and commenters' posts ($n = 93$) in terms of the number of meaningful units in online blogging posts. The test was significant ($t = 7.75$, $p < .001$) and the number of meaningful units in starters' blogging posts ($M = 2.56$, $SD = 1.25$) was significantly higher than that in commenters' blogging posts ($M = 1.23$, $SD = 0.65$).

A *t*-test was also run to examine whether there was a significant difference between starters' posts ($n = 63$) and commenters' posts ($n = 93$) in terms of the nature of meaningful units in their online blogging posts. The test indicated significant differences between the two groups in performing K1 (sharing information, $t = 7.63$, $p < .001$) and K2 (egocentric elaboration, $t = 1.73$, $p < .05$) during blogging. Starters performed more K1 ($M = 1.25$, $SD = 1.05$) and K2 ($M = 0.81$, $SD = 0.93$) than commenters ($M = 0.16$, $SD = 0.54$; $M = 0.59$, $SD = 0.65$ respectively). On the other hand, there was no significant difference between starters and commenters in demonstrating higher-level critical learning (K3, K4, and K5) while blogging. Table 5 shows the results of the test.

This result indicated that although starters wrote longer, more meaningful posts than commenters, these units mostly contributed to individual, surface thinking rather than collaborative, deep thinking. Generally, participants performed few collaborative or higher-level discussions: among the total meaningful units analyzed, only 18%, 15%, and 2% contributed to K3-K5 discussions.

### Research Question 4:  Participant as Both Starter and Commenter

Lastly, a correlation analysis was performed to examine the relationship between participants' average cognitive scores as commenter and their average cognitive scores as starter across both sections of the class. Table 6 shows the results.

The results indicated a significant *inverse* association between participants' average cognitive thinking scores as starters and their cognitive thinking scores as commenters as exhibited in their blog posts: Spearman's $\rho = -.44$, $p = .02$. Therefore, in general, the cognitive thinking score for starters was inversely correlated with the cognitive thinking score for commenters. This means if participants were engaged in relatively higher cognitive thinking when serving as starters, they would more likely refrain themselves from being critical when serving as commenters. In addition, the correlation analysis of average cognitive thinking scores between different roles (starter versus commenter) in two class sections revealed that the inverse association was more pronounced in section two rather than in section one. Table 7 shows the difference of the two sections.

Table 5. Lengths and Cognitive Learning Scores of All Posts As Starters and Commenters

| Group | N | Average number of units per post per week | K1 | K2 | K3 | K4 | K5 |
|---|---|---|---|---|---|---|---|
| Starters | 63 | 2.56 (1.25) | 1.25 (1.04) | .81 (.93) | .25 (.47) | .21 (.41) | .03 (.17) |
| Commenters | 93 | 1.23 (.65) | .16 (.53) | .59 (.64) | .25 (.59) | .16 (.37) | .01 (.10) |
| p-Value | | p = .000*** | p = .000*** | p = .04* | p = .96 | p = .48 | p = .35 |

**Note**: Standard deviations in parentheses.
*p < .05.
***p < .001.

Table 6. Correlation between Average Cognitive Scores Both as Starter and Commenter

| | N | Average cognitive score as starter |
|---|---|---|
| Average cognitive score as commenter | 30 | −.44* |

*p = .02.

Table 7.  Correlations between Average Cognitive Scores Both as
Starter and Commenter in Different Sections of Class

| | N | Correlations between average cognitive score as starter and commenter | p-Value |
|---|---|---|---|
| Section One with questioning starters | 15 | −.363 | .09 |
| Section Two with monologuing starters | 15 | −.427 | .05 |

## DISCUSSION

The current study investigated the extent to which different starter styles could influence students' blogging behaviors including cognitive thinking level exhibited in their blogs, length of their posts, and feedback to others' blogs. The results indicated that monologuing blog starters consistently wrote more and their writing in the blog posts showed higher levels of thinking than the questioning starters. However, the students who replied to questioning starters' blog posts demonstrated a higher level of thinking than those who were in groups with monologuing starters.

### Effects of Different Starter Styles

As shown in the results, different starter styles not only influenced starters' postings but also their commenters' postings. Monologuing starters wrote much more than questioning starters; however, monologuing starters' posts were generally not as thought-provoking as the questioning starters. The theoretical framework of social constructivism synthesized by Schellens and Valcke (2005) as mentioned before could probably explain the difference. The team blog situation in this study, as a social-constructivist computer-supported collaborative learning (CSCL) environment, could support cognitive processes of negotiation and co-construction of knowledge. In this synthesized model, cognitive processing occurs in five phases, and they are:

1. sharing information;
2. identifying dissonance;
3. negotiating;
4. testing tentative construction; and
5. statements of new ideas.

It is likely that when monologuing starters wrote their blog posts, they found controversial topics, compared the differences, and stated their own beliefs. While doing so, they had already made sense and meaning of the situations (Moon, 1999) without negotiation of meanings with their peers. Therefore their posts were self-sufficient by themselves. Subsequently, their group members, when presented with such statements, might have perceived it both difficult and time-consuming to find dissonance within the statements in order to comment critically. In contrast, the questioning starters usually ended their postings with controversial information with little effort to resolve the inconsistency themselves. Hence, their posts were relatively shorter. Possibly, the unresolved questions invited group members in the questioning group to provide answers more easily since there was a direct request for an answer. This interpretation was also supported by the cognitive levels of starters and commenters. Results above showed that starters usually shared information (k1) or interpreted the information with their own experiences (k2) while commenters rarely engaged in these two relatively lower levels of thinking. This finding was also consistent with previous research about peer-led online discussions. For instance, Rourke and Anderson (2002) found students became more participative and responsive when such discourses mainly consisted of exchanges of information and sharing of experiences—simply because students perceived that these discussions encouraged free brainstorming, conversation, and argumentation. In contrast, students felt that any authoritative presence of content could shut down discussion.

## Conversion between Starter and Commenter

The findings indicated a significant difference between starter and commenter in the amount and nature of meaningful units within their posts. A potential explanation for this difference might lie in students' interpretation of different responsibilities associated with the two communication roles. By default, a starter has been deemed by participants as a discussion leader who would act as an expert for the content topic and would contribute the most information or opinions (Harrington & Hathaway, 1994). Thus, a commenter should adopt the role of follower and hence only supplement or extend the starter's perspectives. Such an interpretation has contributed to a starter-dominant or starter-centered one-way interaction where starters led discussions with few arguments and negotiations from peers. It also explains why in this study starters usually wrote longer posts and there were rarely two-way interactions that carried collaborative or allocentric learning discussions (Henri, 1992). In addition, as observed in this study, without purposeful training or clear guides, student-starters wouldn't develop enough awareness or skills to facilitate discussions that usually comprise higher-level knowledge-construction discourses, such as summarization of commenters' perspectives (k3) and making a conclusive judgment of the discussions (k4).

The results also indicated a significant inverse association between participants' average cognitive thinking scores as starters and their cognitive thinking scores as commenters and, moreover, the inverse association was more apparent in section two of the class. This finding could be explained based on participants' interpretations of the blogging task. If some participants regarded blogging as a self-introspective process, as in the case of individual journaling (Xie et al., 2008), they might have expended most effort in their posts when serving as starters of the blog assignment. On the contrary, if other participants perceived this assignment as a form of online discussion where everyone should contribute relatively equally to the conversation, they might not employ much effort in their starter posts but become more critical thinkers as the conversations accumulated. Moreover, the application of different starter styles reinforced particular interpretations of the task. It seems that the monologuing starter style reinforces an interpretation of blogging as self-introspective journaling while the questioning starter style encourages an interpretation of team blogging as interactive, collaborative exploration.

## LIMITATIONS AND FUTURE RESEARCH

One limitation was that this study employed a quasi-experimental design instead of true random assignment. However, because of the nature of the team-blog assignment, the treatment itself posed difficulties of exercising random assignment—if students in the same sections of the course know about these different assignments, serious threats to the internal validity, such as experimental diffusion or resentful demoralization, could be introduced into the study. If random assignment is to be used in future research, special efforts should be expended to ensure students do not have the opportunity to share their blogging experiences. A next step in this area of research is also to examine the student posts using a descriptive framework and to identify differences in sophistication in the levels of thinking represented within K1-K5.

The researchers also collected the instructor's direct feedback on the blog site, hoping to gain an additional avenue to comprehend the data. However, it was found that although the instructor monitored the blogging activities, he only responded to each group's blogs three to four times on average over the 10-week span. Most of the instructor's moderations of this activity were offered in the form of in-class oral comments and supplemented by individual e-mail communications. The limited number of written evidences accessible to the researchers could not justify categorical analyses of the instructor's moderation or warrant further statistical analysis. In future studies, examining the interaction between the students and instructor through both statistical and descriptive analysis methods might more clearly define the role and impact of instructor moderation on student thinking as represented in the blogs.

This study also presents some interesting challenges for design of future peer-interaction blogs. As described earlier, it is likely that the initial role of the student in each blog post reinforces a specific view of the function of the blog. The challenge for instructors is to design the interaction in such a manner that the benefits of both monologue and online discussion board engagements are apparent. In addition, the design must meticulously balance the learning afforded to the individual and to the group members through their interaction. Specifically, if questioning starters are more likely to encourage commenters to engage in higher levels of thinking, but at the same time reduce the need for the individual starter to engage in higher levels of thinking, then this must be addressed through deliberate design. This study suggested one possible option where roles are rotated over different weeks. Other options should be explored through further design research.

In conclusion, the present study has provided empirical evidence about the effects of different starter strategies on students' team-blog participation. These findings also provide practical insights about how to incorporate this popular Web 2.0 technology into a traditional lecture-based college classroom to enhance deep cognitive thinking.

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